ETABS Steel Frame Design

AISC 360-16 Steel Section Check (Strength Summary)

Element Details

Level	Element	Unique Name	Location (in)	Combo	Element Type	Section	Classification
Story2	D146	331	211.2569	UDStlS32	Ordinary Concentrically Braced Frame	HSS5X5X5/16	Non-Compact

LLRF and Demand/Capacity Ratio

L (in)	LLRF	Stress Ratio Limit
422.3276	1	0.95

Analysis and Design Parameters

Provision	Analysis	2nd Order	Reduction
ASD	Direct Analysis	General 2nd Order	Tau-b Fixed

Stiffness Reduction Factors

$\alpha P_r/P_y$	$\alpha P_r/P_e$	τ_b	EA factor	EI factor
0.003	0.005	1	0.8	0.8

Design Code Parameters

Ω_b	Ω_c	Ω_{TY}	Ω_{TF}	Ω_V	$\Omega_{V\text{-}RI}$	Ω_{VT}
1.67	1.67	1.67	2	1.67	1.5	1.5

Section Properties

A (in²)	J (in⁴)	I_{33} (in⁴)	I_{22} (in⁴)	A_{v3} (in²)	A_{v2} (in²)
5.26	31.2	19	19	2.4	2.4

Design Properties

S_{33} (in³)	S_{22} (in³)	Z_{33} (in³)	Z_{22} (in³)	r_{33} (in)	r_{22} (in)	C_w (in⁶)
7.6	7.6	9.16	9.16	1.9006	1.9006	

Material Properties

E (lb/in²)	f_y (lb/in²)	R_y	C_{pr}	α
29000000	46000	1.1	1.4	NA

HSS Section Parameters

HSS Welding	Reduce HSS Thickness?
ERW	No

Stress Check forces and Moments

Location (in)	P_r (kip)	M_{r33} (kip-ft)	M_{r22} (kip-ft)	V_{r2} (kip)	V_{r3} (kip)	T_r (kip-ft)
211.2569	-0.392	-0.0247	-0.0002	3.568	4.499E-05	-0.0066

Axial Force & Biaxial Moment Design Factors (H1-1b)

	L Factor	K_1	K_2	B_1	B_2	C_m
Major Bending	0.5	1	1	1	1	1
Minor Bending	0.5	1	1	1	1	1

Parameters for Lateral Torsion Buckling

L_{ltb}	K_{ltb}	C_b
0.5	1	1.313

Demand/Capacity (D/C) Ratio Eqn.(H1-1b)

D/C Ratio =	$(P_r/2P_c) + (M_{r33}/M_{c33}) + (M_{r22}/M_{c22})$
0.004 =	0.003 + 0.001 + 9.234E-06

Axial Force and Capacities

P_r Force (kip)	P_{nc}/Ω (kip)	P_{nt}/Ω (kip)
0.392	63.153	144.886

Moments and Capacities

	M_r Moment (kip-ft)	M_n/Ω (kip-ft)	M_n/Ω No LTB (kip-ft)	M_n/Ω Cb=1 (kip-ft)
Major Bending	0.0247	21.0259	21.0259	21.0259
Minor Bending	0.0002	21.0259		

Torsion Moment and Capacities

T_r Moment (kip-ft)	T_n Capacity (kip-ft)	$T_n/\Omega_{Capacity}$ (kip-ft)
-0.0066	29.4641	17.6432

Shear Design

	V_r Force (kip)	V_n/Ω (kip)	Stress Ratio
Major Shear	3.568	39.696	0.09
Minor Shear	4.499E-05	39.696	0

End Reaction Axial Forces

Left End Reaction (kip)	Load Combo	Right End Reaction (kip)	Load Combo
-13.526	UDStlS48	-13.526	UDStlS32